HERPES OF THE MEMBRANA TYMPANI: DUE TO ZOSTEROID AFFECTION OF THE PETROSAL GANGLION

By Thomas J. Orbison, M.D.,

OF LOS ANGELES, CAL.

The infectious nature of herpes zoster (zona, zosteroid) is accepted by competent observers. That the location of the responsible lesion is in the cells of the spinal ganglion type is likewise accepted.

The various syndromes attached to the zosteroid infection of the different ganglia have been carefully worked out in many instances. One of the most recent is that by J. Ramsay Hunt in an interesting paper presented at the meeting of the American Neurological Association in 1906, and published in the Journal of Nervous and Mental Disease, February, 1907. Hunt's paper dealt with herpetic inflammation of the geniculate ganglion; its basis was a series of sixty cases, all of which had a facial palsy of the peripheral type in addition to the zoster. The deductions as to the zoster-zone of the geniculate included all portions of the auricle. The membrana tympani seemed to be tacitly included in this zone, but the case to be recorded below would seem to warrant the substitution of the petrosal for the geniculate.

The basis for the deductions as to the zone of the geniculate rested upon a mapping-out of the areas of anesthesia subsequent to the extirpation of the Gasserian ganglion for the relief of tic douloureux, in the cases of Spiller and Frazier, and of the second and third cervical ganglia in a case of Harvey Cushing.

The zoster zone of the petrosal ganglion has not, heretofore, been mentioned, as far as I can find. The petrosal ganglion of the glossopharyngeal nerve plays the same role as the geniculate on the seventh. It supplies the membrana tympani by means of the tympanic plexus which sends branches over the promontorium lying just posterior to the membrane. These reach the " stratum mucosum," or posterior layer of the membrane by many filaments that come in from both sides and spread in a fine plexus throughout it (the anterior layer, "stratum cutaneum," is supplied in part by the auriculo-temporal).

The relation of near-by parts is as follows: The geniculate ganglion lies above, posterior to and separated from the membrana tympani by the bony septum that separates the canal of the facial nerve from the tympanic cavity. It is (comparatively) remote from the tympanic plexus and connected with it by the fine rami anastomotici. Any affection of the geniculate must needs be extensive to reach down to the tympanic plexus—extensive enough to involve the facial, certainly, as was the case in all of Hunt's series. The chorda tympani nerve passes just posterior to the upper edge of the membrana, but does not supply it; it passes, in this location, through the tympanic plexus, but gives no branches to it. The lesser petrosal nerve comes over from the otic ganglion and is intimately connected with the tympanic plexus at a point above the promontorium. The promontorium lies just back of the membrana and is exposed when the membrana is removed.

The Ganglion Petrosum.—Chas. K. Mills in his authoritative work, "The Nervous System and Its Diseases," says on page 103: "Various well-known cranial ganglia correspond morphologically and functionally to the ganglia of the dorsal spinal roots—the petrous and jugular for the glossopharyngeal," etc. The functions of the former have to do (vide supra) with the membrana tympani. The branches that spread over the posterior surface of the membrana come from it. Inflammation of the petrosal ganglion would extend, logically, to the membrana tympani. An herpetic inflammation would exhibit its typical lesion or lesions on and posteriorly to the membrana. Thus we have mapped out for us the herpetic zone of the petrosal ganglion.

Anatomy of the Membrana Tympani.—It is a very thin, smooth membrane stretched out between the external acoustic canal and the cavity of the tympanum. It is fastened by a somewhat thickened margin in the sulcus tympanicus by means of a fibrocartilaginous circular pad and is at that point sharply marked off from its surroundings. It is covered on its lateral surface by the "stratum cutaneum," a continuation of the external skin. Following upon this is the "stratum radiatum"—a connective tissue membrane in which the fibers run radial to the handle of the malleus; likewise a "stratum circulare" in which the fibers are concentrically arranged. These last two layers are connected to the fibrocartilaginous ring. The inner surface is the "stratum mucosum"—a continuation of the mucous membrane of the tympanic cavity. It is in this layer that the branches (rami tubæ) of the tympanic plexus ramify.

Rarity of Herpetic Inflammation of the Auricle.—Hunt has examined the records of the Manhattan Eye and Ear Dispensary of New York—47,600 cases in the past ten years; the Brooklyn Eye and Ear Hospital—15,000 cases in the last five years; the New York Eye and Ear Infirmary for the last twenty-three years—averaging 10,000 cases yearly; in all of these the diagnosis of herpes of the auricle was made only nine times. In the Massachusetts Eye and Ear Infirmary the diagnosis was made thirty-three times in 65,000 cases. Admitting that the condition may have existed and was not diagnosed as herpes, nevertheless it will be seen at a glance that the affection is a very rare one. As for herpes of the membrana tympani—it is well-nigh unheard of. Pollitzer says of it that Hartmann saw it once. Hunt speaks of it in this wise—the typical eruptions are situated "on the concha, on the lobule, the tragus, the marginal portions of the auricle (helix and antihelix) and within the auditory canal—indeed, as rarely happens, on the *membrana tympani* itself" (the italics are his).

Record of a Case of Zosteroid Herpes of the Membrana Tympani.—Miss C. is of a long-lived, healthy family. A point of great interest in her family history is that her brother had herpes zoster when he was a young man. Another point to be reckoned with is that gouty and rheumatic affections have been the prevailing family ills. As a child she was inclined to be nervous; was never robust but never ill. As a young girl she was healthy. As she grew older she was often troubled by stiffness in various joints; this was especially marked in the mornings and they would be "limbered up" by exercise. As she has advanced in years she has had rheumatic attacks that at times were severe, *e. g.*, her hands have often become incapacitated, due to painful joints.

During the last three or four years she has often had zosteroid eruptions along the course of various nerves. Her brother, who was a well-known physician in New York City before he came to California, kept a careful watch over the condition and can vouch for it. In addition, she has had gouty attacks that have been controlled by colchicum.

In November, 1906, her present illness began with a painful throat and naso-pharynx—a typical gouty condition. This was at once followed by severe aching pains all over her body and accompanied by anorexia and vomiting (note the infectious nature of the onset). On the third day there was earache, tinnitus and fulness in the ear on the left side; the pain was not superficial but deeply seated. The tinnitus was at times crackling in character. Deafness soon followed and the ear felt as though it were "built away out" from the head.

Dr. W. H. Roberts, of Pasadena, was called in and his notes of the aural examination showed a "bleb directly on the membrana tympani and beginning on the lower left quadrant posteriorly." He noted that the examination gave but little pain as the aural speculum was manipulated. The bleb soon covered the whole drum and the appearance of it was as though it were a rounded crystal. It remained intact three days and was associated with deep tenderness back in the ear. At the end of that time a watery liquid escaped during the night. Since then the deafness has entirely gone. There has been no more herpes of the membrana tympani, but there have been eruptions elsewhere, *e. g.*, in the mouth on the palatine and alveolar regions. During the whole illness there has been a polyneuralgia that has been persistent and most annoying. Other unpleasant symptoms have been mental depression and general neurasthenic condition. I was called in consultation by Dr. Roberts and made the diagnosis of herpes of the membrana tympani due to a zosteroid infection of one of the cranial ganglia; probably the petrous, on the glossopharyngeal—plus neurasthenia and polyneuralgia.

Conclusions.—The petrosal ganglion is of the spinal ganglion type (Mills). Herpes zoster (zona, zosteroid) is accepted as an infectious inflammation of ganglia of the spinal ganglion type. These ganglia have their "zoster zones." The "zoster zone" of the petrosal could be either (*a*) widespread (to include its outermost branches); (*b*) intercalated between similar inflammations of neighboring ganglia of like type (geniculate, jugular, Gasserian, etc.); or (*c*) confined to its own principal branches.

The principal end branches of the petrosal ganglion are those that intersect the membrana tympani after they leave the promontorium, which is just back of the membrana and is exposed when the membrana is removed.

In my case the herpetic exhibition was at first limited to and on the posterior surface of the membrana tympani and was, therefore, an exhibition of an herpetic inflammation of the main branches of the petrosal ganglion (later, other spinal ganglia were affected). I say it was limited because the evidences were wanting that would have implicated the geniculate; there was no involvement of the facial nerve, chorda tympani or pars intermedia of Wrisberg; nor were any other ganglia convicted of implication, *e. g.*, there was no involvement of the auriculo-temporal nerve; affection of the otic or of the sphenopalatine ganglion would have had to be severe to reach over to the tympanic plexus via the lesser and greater petrosals respectively; such an extensive involvement would have reached the geniculate as well; it was not reached in my case, therefore they may be dismissed.

The condition of herpes zoster (zona, zosteroid) of the membrana tympani is so rare that its rarity alone is of interest. There is an added and much wider basis of interest in its study, inasmuch as cumulative evidence may help to map out the various ganglia zones more clearly, thus adding to knowledge. As to the "zoster zone" of the geniculate ganglion as depicted in Hunt's paper it would seem as though it were hardly sufficiently proven. The fact that the extirpation of the Gasserian ganglion—or severance of the nerve centrally to the ganglion—left intact the sensation in the auricle would not necessarily prove that the geniculate ganglion was the avenue of that sensation. According to Hunt (or, better, accepted by him) the auriculotemporal nerve fibers do not pass through the inferior division of the fifth to the Gasserian ganglion and the question is asked "how do they reach the brain?" His answer is that they must do so via the geniculate ganglion. But is that the only course? He suggests another possibility, *i. e.*, they might pass to the otic ganglion and thence to the geniculate via the lesser petrosal nerve; the lesser petrosal is connected with the geniculate ganglion, but it is even more intimately connected with the petrosal ganglion of the ninth cranial nerve by means of the tympanic plexus.

Another suggestion is that afferent stimuli might return via the auricular branches of the tenth; but would not sensation travel by way of the jugular ganglion of the tenth rather than by the geniculate, which is a more round-about way? In other words, the zoster zone that is ascribed to the geniculate could be explained by intercalating the zones of other ganglia—the petrosal ganglion being responsible for the membrana tympani, etc.

In all of the sixty cases in Hunt's series there was a facial palsy of the peripheral type which was construed to mean that the geniculate was the ganglion at fault and that the herpetic exhibition measured the zone of the geniculate inflammation. Would it not be just as logical (in the absence of positive proofs) to explain them as being due to an extension of inflammation *to* the geniculate *from* other nearby ganglia or by the well-known frequency of the implication of the neighboring ganglia in herpetic inflammations—the geniculate being involved synchronously with others? Likewise, the facial palsy might be a separate affection that came on as a result of the same cause that produced the herpes; " facial palsy is the commonest form of paralysis " (Mills).

In both of the two cases described in Hunt's paper this might seem to be the case. In the first case the exciting cause was an hour's exposure of an elderly woman to a winter storm (a sufficiently severe cause to account for both affections). The second case was a periodic drinker who had a facial palsy following an exhibition of zoster that had attacked the occipito-cervical area. A discussion of the merits or demerits of the various ganglia that are responsible for the several zoster zones in literature is academic rather than scientific in character, inasmuch as the positive proofs of a sufficient number of autopsies are wanting. In the second of Hunt's cases the geniculate ganglion was, unfortunately, not able to be examined; there is no record of nearby ganglia other than the Gasserian, which was normal. The " pars intermedia of Wrisberg " on the affected side was found to be sclerotic. This nerve has its origin in the geniculate ganglion (Mills). A sclerotic condition of the nerve would not, however, prove an herpetic inflammation of the ganglion.

In my case the herpetic blebs that appeared in the mouth—on the palatine and alveolar regions—were explained by an extension along the ninth nerve from its petrosal ganglion (the primary seat of infection) or by an extension to the spheno-palatine ganglion along the vidian via its branches, the greater superficial and deep petrosals. Finally the condition of zosteroid in my case was one that was superimposed in a severe neurasthenic condition that was itself due to a long-continued seige of domestic cares, worries and anxieties. Its course was long. It varied as did the nervous state of the patient. It has seemed to be of an infectious nature, chronic in its course and dependent upon the lowered tone of the individual; a subject that was primarily gouty and neurotic.

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